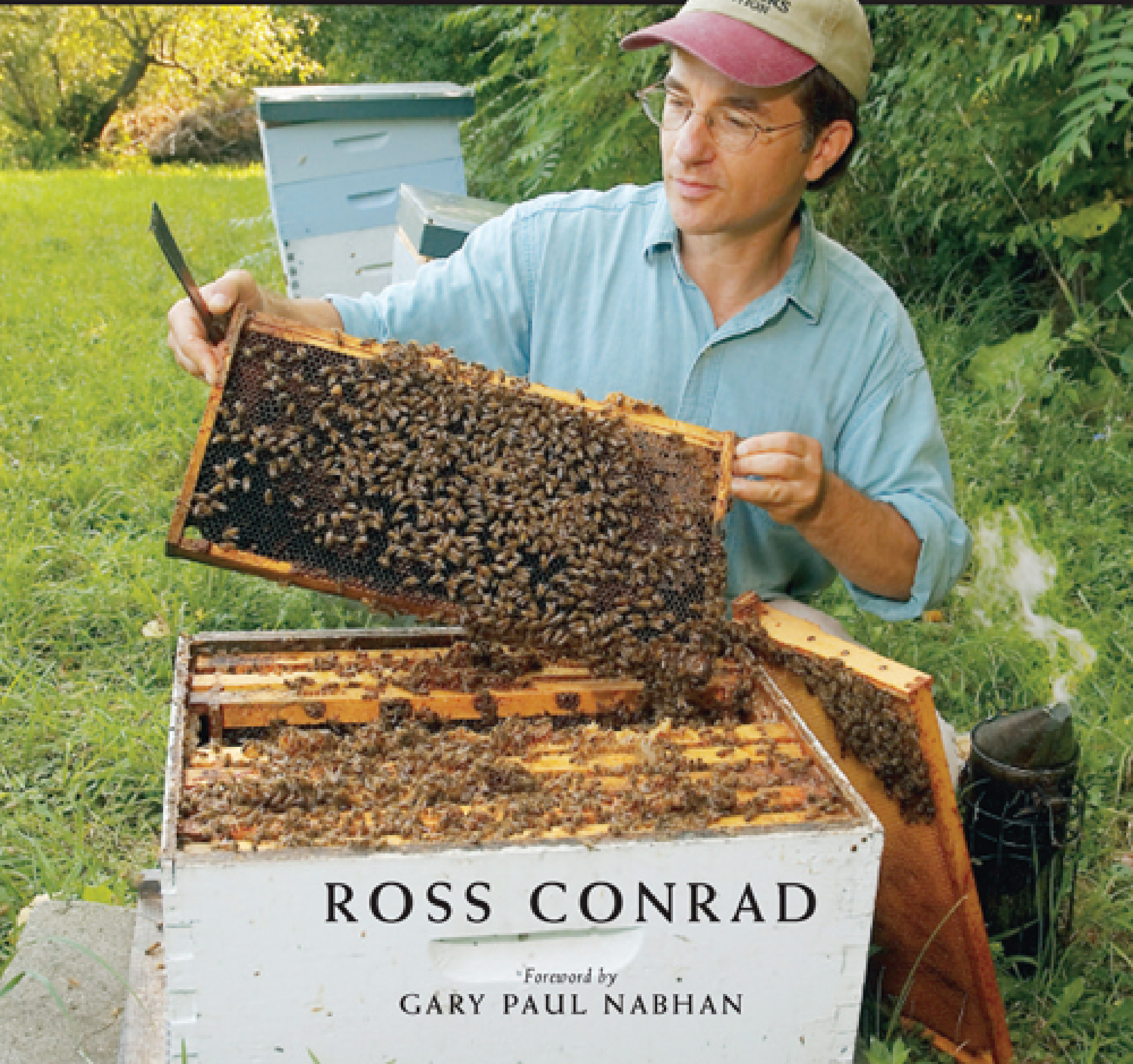
Natural BEEKEEPING

ORGANIC APPROACHES TO MODERN APICULTURE



ROSS CONRAD

Foreword by

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CHAPTER ONE

WHY ORGANIC BEEKEEPING?

We must be the change we wish to see in the world.

—Mahatma Gandhi

The Hive as Teacher

We can learn so much from the honey bee, who also goes by the Latin name of *Apis mellifera*. Of all the insects, the honey bee seems to lend itself most perfectly to anthropomorphism. For example, the relationship between the bee and the plant kingdom is a powerful and intricate orchestration of interdependence and cooperation. To live its day-to-day life, the bee need only collect nectar and pollen from the flowers in bloom. These gifts from the plant kingdom, along with some water, plant resins that the bees use to make propolis, fresh air, and sunshine, are all the bees need from the world around them to survive and prosper within their colony. Thus, unless it feels threatened and is forced to defend itself or its hive, the bee is the only creature in the animal kingdom, that I am aware of, that does not kill or injure any other being as it goes through its regular life cycle. *Apis mellifera* damages not so much as a leaf. In fact, honey bees take what they need in such a way that the world around them is improved. By

pollinating blossoms during nectar- and pollen-foraging activities, the honey bee contributes directly to the abundance found on Earth. This industrious little creature even transforms the nectar it collects from sugar water into deliciously sweet and health-promoting honey.

As a result, beekeeping is a wonderful way to give back to the world and help make it a better place, while at the same time receiving many incredible gifts. It is a pleasure to know that, although they may not realize it, my neighbors down the road are able to enjoy a bountiful harvest from their garden due, in part, to the pollination services rendered by the honey bees in my care. I like the fact that my hives, working in conjunction with the local plants, help produce an abundance of nuts, seeds, fruits, berries, et cetera, so the birds and other wildlife living in the area around my bee yards have plenty to eat. Because many of the seeds and nuts that are not eaten will develop into a variety of beautiful flowers, herbs, bushes, and trees, my neck of the woods is more likely to be a beautiful and bountiful place to live for many years after my passing. By directly participating in the creation of numerous seeds, nuts, fruits, and vegetables through cross-pollination, the honey bee benefits plants, animals, and humans alike. Farmers know that as the number of bees in an area increases, so will the quality of the fruits and vegetables grown in the region.

All the while, the bee is going about the business of creating honey, a substance that not only tastes wonderful but can help heal burns, cuts, infections, and numerous other maladies of the body. So much has been written about the amazing healing aspects of honey that I will not go much further into this topic other than to encourage the reader to investigate the many benefits of this "first-aid kit in a jar." Honey is something so precious and special; even with our highly developed technological sciences, we humans still have not been able to duplicate the efforts of the simple honey bee and create the same substance from what amounts to nothing more than sugar water.

The honey bee inspires me to work into my daily life this lesson: that we should take what we need to live in the world in such a way that we give something back and improve upon things, thus making the world a better place. Many of the world's problems could potentially be solved in short order if every person took this single lesson from the honey bee to heart and worked to manifest it in his or her life.

The propensity of the honey bee to focus on one type of flower during each foraging trip makes it ideally suited for crop pollination. Photo by Steve Parise.

The indigenous peoples that inhabited the Americas prior to the arrival of Europeans shared a philosophy that regarded the natural world as a teacher. They saw that in the natural balance of life, extremely diverse organisms live in coexistence. Everything has its place in the order of things. Unfortunately, this tolerance seems to have been lost in the industrial model developed by our Western culture. Although the industrialization of agriculture offers much promise, it also has created many serious problems. This industrial model produces the zero-tolerance mentality that gives birth to the toxic chemical treatments typically used in agriculture, and recently embraced by many in the beekeeping community.

A more holistic approach, one that views the honey bee and the hive environment in terms of a biological model, stems from a nature-based beekeeping philosophy. In this model, the concepts of coexistence and tolerance are included. This perspective precludes the use of toxic chemical solutions that seek to wipe out every pest in the hive. The holistic viewpoint recognizes the unique role played by all of the creatures of creation. Everything has its place and reason for being, even if it is not immediately obvious. I must admit to not being privy to the reason for the existence of the mite known as varroa (*Varroa destructor*), which has become the bane of the beekeeping industry in many parts of the world. However, I am certainly thankful for its presence, if for no other reason than the trouble it has caused beekeepers and honey bees has inspired so many people to seek alternatives to the reigning beekeeping paradigm of our times: the industrial model. Once again, nature is teaching us to seek out a bigger picture.

Toxic Chemicals Infiltrate the Classroom

As of 1987, the keeping of honey bees was the only widespread agricultural endeavor in the United States that had not become reliant on toxic chemicals to secure a harvest. In that year the parasitic mite

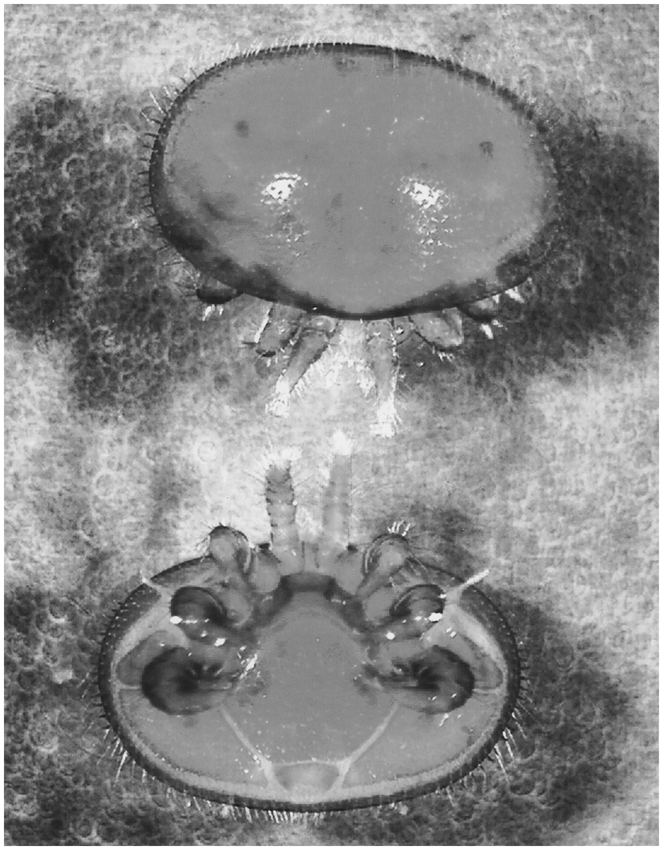
Varroa destructor, formerly *Varroa jacobsoni,* was first observed in hives located in the United States. This mite—known to infest honey bee colonies and suck blood from the bees, causing weight loss and deformities, spreading disease, suppressing immunity, and reducing life span—has since spread throughout America, assisted in part by the unwitting cooperation of migratory beekeepers. The overwhelming hive losses experienced by U.S. beekeepers in subsequent years prompted an outcry from the beekeeping industry for assistance. The response followed the same path tread by other agricultural commodity groups that have had a need to control insect pests threatening their crops. Beekeepers turned to toxic chemical compounds to solve their mite problem. Unfortunately, hindsight shows that this approach is a short-term solution, at best.

Since the end of World War II, when pesticides first became widely utilized, insects have consistently developed resistance to the toxic chemicals that have been used to control them. The response from agribusiness has been to turn either to higher doses of chemicals or to more toxic compounds in an effort to keep pests in check. History repeated itself with the beekeeping industry's approach of inserting chemical-impregnated plastic strips into the hive to control varroa mites.

The first strip was released in 1992 and went by the brand name Miticur. The strip, when introduced into the hive, carried with it a dose of the chemical amitraz, which was designed to be toxic enough to kill the mites, but not so potent as to kill the bees on which the mites reside. This approach to pest control is similar to using chemotherapy drugs in the treatment of cancer. Chemotherapy drugs are toxic to healthy cells as well as cancer cells. However, the chemotherapy treatment protocol calls for a dosage that is toxic enough to kill the cancer before the drugs have the effect of killing the person hosting the disease. Unfortunately, many beekeepers continued to experience huge hive losses despite treating with Miticur, so it was removed from the U.S. market after a short duration, although it continues to be marketed in Europe under the trade name Apivar. At the time of its discontinuation, some people believed there had been a problem with the strips containing the wrong dosage of pesticide, which failed to kill the mites out-right and allowed the mite to develop resistance to the chemical. However, our lack of knowledge and experience with this new mite may have also played a role in Miticur's apparent failure. Unless the unlikely event of production prob-

lems during pesticide manufacturing occurred, the beekeepers who initially experienced major losses to the mite despite their use of Miticur were probably treating their hives too late in the season, without realizing it. Remember, this was in the early 1990s, and beekeepers had not yet gained much experience dealing with the varroa threat.

The next pesticide strip to be utilized in the hive was Apistan, which relied on the active chemical component fluvalinate. Fluvalinate is related to the pyrethrin family of pesticides that are synthesized from plants and is unlike its more toxic and long-lasting cousins, that are derived synthetically from petroleum. In contrast to Miticur, this product initially gained success on the market. Unfortunately, after several years of Apistan use, resistance to fluvalinate became widespread among varroa mites, and the industry turned to a much more toxic synthetic chemical compound called coumaphos. Classified as an organophosphate, coumaphos is sold under the trade name CheckMite.



Australia is the only continent with bees that does not support a population of* Varroa destructor *. . . so far.
Photo by Steve Parise.

Organophosphates are among the most toxic chemical compounds used in agriculture. In fact, organophosphates are so toxic and persistent in the environment that at the present time there is an effort by the U. S. Environmental Protection Agency (EPA) to wean agriculture off these compounds, with the goal of eventually removing them from the market altogether. CheckMite is similar to Apistan in that it relies on a plastic strip inserted into the hive to introduce the chemical control. Unfortunately, it took only a few years before varroa began showing resistance to coumaphos as well. The conventional approach has since evolved into using a rotation between Apistan and CheckMite, altering their use from season to season in the hope that mites resistant to one chemical will not be resistant to the other. Undoubtedly, new synthetic toxic chemicals will be approved for use

against varroa in the future in order to help further address the resistance factor that varroa has developed to existing treatments. Walking this chemical treadmill may prove effective in controlling varroa for a short period, until the mites become resistant to them all. Unfortunately, these toxic compounds have the ability to accumulate in beeswax and honey, and this increases the potential for chemical contamination, resulting in undesirable consequences for both beekeepers and consumers. Anecdotal stories of beekeepers using the active ingredients fluvalinate, amitraz, and coumaphos in unregistered and illegal ways further exacerbate this situation. The fact that varroa mites developed resistance to amitraz, despite the relatively short time it was available for legal use by beekeepers, supports such anecdotal evidence.[1] Increased costs associated with these "chemotherapy" treatments have reduced the profitability of the beekeeping industry. In addition, the backlash that may result if honey on the market is found to be contaminated with one or more of these pesticides, combined with their lack of effectiveness, greatly decreases the value of the chemical approach to mite control for beekeepers.

> The effect of exposing honey bees to sublethal doses of certain chemicals is rarely discussed. Just as with people, the long-term health and vitality of the hive is likely to be compromised from such exposure, even if such detrimental effects are not readily and immediately evident.

While the conscientious apiculturist will follow the directions on the pesticide label and wear gloves during application, exposure during use can still occur. Chemical contamination is most likely to result from secondary exposure, after the beekeeper touches objects with the chemically laden gloves worn while applying the pesticide. This is inevitable if the beekeeper works the bees without assistance, as is the case with most hobby and small beekeeping operations. I am reminded of the time I was assisting with the installation of some CheckMite strips in a bee yard. One person's job was to smoke the bees and remove and then replace the hive covers, while the other person, wearing gloves, inserted the strips into the hive once the covers were removed. On this occasion, while the strips were being placed into a hive, a bee flew up and stung me on my eyelid. My initial reaction of shock and pain triggered my kindhearted coworker to want to help me. He instinctively reached up to remove the barbed weapon from my face as I was groping blindly at my pulsating eyelid and having difficulty removing it myself. The look of utter horror that crossed my

face as I backed slowly away from the coumaphos-laden glove caused us to break out in hysterical laughter. This was undoubtedly the fastest recovery from being stung in a sensitive area that I had ever experienced. It also demonstrates how situations can arise when even a cautious individual can be exposed to the dangerous chemical pesticides used in conventional apiculture.

As a boy, I remember hearing it reported by the U.S. Centers for Disease Control (CDC) that almost one out of every three American citizens could expect to get cancer at some point in their lifetime. Today, the CDC tells us that on average over 44 percent of the people in the United States can expect to get some form of cancer during their life, and this statistic keeps rising each year.[2] Meanwhile, the inventory of other degenerative metabolic diseases that plague our modern society continues to stack up like cordwood and is far too long to recite fully. They include not only cancer but attention deficit disorders, mental retardation, leukemia, male sterility, and birth defects—all of which can be linked to the poisons used in and around our food supply. It is said that, despite the many hazards of Western culture, beekeeping ranks high among the professions whose participants tend to live long and healthy lives when compared to people who make other career choices. It will be interesting to see if the potential for contamination due to the relatively recent advent of toxic chemical use within the beekeeping industry will adversely affect this favorable designation.

The effect of contaminated honey on consumers and their purchasing habits also becomes an issue when chemicals become an integral part of the beekeeper's management of pests. Research in Europe has shown that the chemicals used to control mites in hives are readily absorbed by beeswax. These pesticides and their chemical breakdown products have the potential to migrate into the honey that is stored in the wax combs. By approving the use of these miticides, the EPA has deemed the potential for such low-level contamination acceptable for both fluvalinate and coumaphos, claiming that allowable residue levels in honey and wax are not exceeded when these materials are applied according to the label instructions. However, as health food advocates have been pointing out for years, just because you can make it to the door after consuming minute quantities of these toxic compounds does not mean that they are benign and have no deleterious effects in the long run.

The effect of exposing honey bees to sublethal doses of these compounds is rarely discussed. Just as with people, the long-term health and vitality of the hive is likely to be compromised from such exposure, even if such detrimental effects are not readily and immediately evident. Because long-term tests have not yet been done, we may yet find that physiological and metabolic changes occur within honey bee populations over extended periods, and these detrimental effects may become obvious only after several decades of exposure. Research indicating reduced sperm counts in drones that have been exposed to coumaphos, and the negative effects on queens reared in cells constructed out of coumaphos-impregnated wax, validates these concerns.[3]

The effects of repeated exposure of bees and humans to small amounts of several toxic chemicals simultaneously is also unknown. The EPA requires safety studies be carried out only on individual pesticides in isolation, rather than in combination with one another. In actual practice, more than one chemical may be utilized by a beekeeper during the course of the season. Knowing that compounds may combine synergistically and have a greater effect when acting together than when used alone raises serious concerns about the effectiveness of the regulatory guidelines that are designed to safeguard our health and the health of our bees.

The Meaning of Organic

Despite widespread belief to the contrary, the term *organic* does not mean that the final crop or product is totally free from toxic chemical contaminants. This mistaken perception has taken hold primarily due to the efforts of manufacturers and marketers, who have successfully promoted the notion that organic products are pure and chemical free. Meanwhile, because of the success of this viewpoint, resentment has built up among many beekeepers who feel that the organic label relegates their own commercially produced honey to second-class status. What was once considered a natural, healthy product is now deemed inferior, when, in fact, the final products of conventional and organic production may not be all that dissimilar in terms of their chemical composition.

At its inception, the organic approach traditionally referred to a management style and philosophy that is biological in nature. Rather than being a statement about product purity, *organic* was all about the big picture. It referred to approaches that care for the life in the soil and minimize the use of nonrenewable inputs and energy sources, such as those derived from petroleum. Organic principles embraced an attitude of fairness and care in regard to our common environment, as well as social concerns such as the welfare of farm workers. One of the original aims of organic agriculture was to establish a sense of stewardship for the earth, embracing human-scale operations that fit harmoniously with the landscape and local community. Although it was certainly possible that organic management practices would result in a cleaner product, it was not the primary focus. Instead, organic management sought to mimic the natural world in its efforts to be sustainable, with the ability to be carried on indefinitely, as nature has proven herself to be. For example, organic farmers have long relied on beneficial insects that feed on pests in order to reduce crop damage, such as the large-scale release of ladybugs to reduce the level of aphids on a crop. Some farmers and growers use traps on a regular basis. These traps mimic the effect of natural predators by removing unwanted insects, often by luring the unsuspecting victim using a synthetic version of a natural pheromone attractant. These are just a couple of the approaches to pest control that copy the ways the natural world will spare some plants over others from the damaging effects of insect predation. Although these types of approaches may have little impact on the quality of the final crop, they are integral to the organic philosophy that stands behind the finished product.

I like the fact that my hives, working in conjunction with the local plants, help produce an abundance of nuts, seeds, and berries so the birds and other wildlife living in the area around my bee yards have plenty to eat.

In contrast, one of the guiding principles of the industrial model that has been so aptly developed by Western culture is the desire to maximize production. When applied to agriculture, this typically results in the drive to push biological organisms to the limits of their capacity. Unfortunately, the focus on increasing our harvest seems to distract our attention from the quality of the crop that is being produced and the health of the plants or livestock that are doing the producing. In the dairy industry, for example, the cow that historically

produced 15 to 20 pounds of milk a day and lived for fourteen years or more in a healthy, relatively disease-free state has today been bred to pump out an average of 90 to 120 pounds of milk a day and has to be sent to the slaughterhouse within three or four years simply because she becomes exceptionally prone to sickness and disease from the stress of the forced increase in milk production. The poor cows are literally worn out. The humble honey bee is similarly affected by our efforts to artificially boost the size of its honey crop. Activities such as the use of chemical mite controls or the feeding of sugar syrups and pollen substitutes, although beneficial to honey production in the short term, ultimately weaken the vitality of the hive and increase its vulnerability to diseases and pests such as varroa. As a result, such management tools should be used sparingly, if at all.

Our industrial model encourages large-scale production under the "economy of scale" argument that has been the drumbeat of U.S. schools of agriculture since the end of World War II. That is to say, "If you want to be profitable, you must grow larger." Although this makes sense in many industries, the fallacy of this approach when applied to farming—an inherently biological activity—is spelled out by Brian Halweil of the Worldwatch Institute in the book *Eat Here: Reclaiming Homegrown Pleasures in a Global Supermarket*.

> In the post-war period, along with increasing mechanization, there was an increasing tendency to "outsource" pieces of the work that the farmers had previously done themselves—from producing their own fertilizer to cleaning and packaging their harvest. That outsourcing, which may have seemed like a welcome convenience at the time, eventually boomeranged: at first it enabled the farmer to increase output, and thus profits, but when all the other farmers were doing it too, crop prices began to fall.
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> Before long, the processing and packaging businesses were adding more economic value to the purchased product than the farmer, and it was those businesses that became the dominant players in the food industry. Instead of farmers outsourcing to contractors, it became a matter of large food processors buying raw materials from farmers, on the processors' terms. Today most of the money is in the work the farmer no longer does—or even controls. Tractor makers, agrochemical firms, seed companies, food processors, and

> supermarkets take most of what is spent on food, leaving the farmer less than 10 cents of the typical food dollar. (As noted earlier, an American who buys a loaf of bread is paying about as much for the wrapper as for the wheat.)
>
> Ironically, then, as farms became more mechanized and more "productive," a self-destructive feedback loop was set in motion: over-supply and declining crop prices cut into farmers' profits, fueling a demand for more technology aimed at making up for shrinking margins by increasing volume still more. Output increased dramatically, but expenses (for tractors, combines, fertilizer, and seed) also ballooned—while the commodity prices stagnated or declined. Even as they were looking more and more modernized, the farmers were becoming less and less the masters of their own domain. On the typical Iowa farm, the farmer's profit margin has dropped from 35 percent in 1950 to 9 percent today. To generate the same income (assuming stable yields and prices), the farm would need to be roughly four times as large today as in 1950—or the farmer would need to get a night job. And that's precisely what we've seen in most industrialized nations: fewer farmers on bigger tracts of land producing a greater share of the food supply. The farmer with declining margins buys out his neighbor and expands or risks being cannibalized himself.
>
> There is an alternative to this huge scaling up, which is to buck the trend and bring some of the input-supplying and post-harvest processing—and the related profits—back onto the farm. But more self-sufficient farming would be highly unpopular with the industries that now make lucrative profits from inputs and processing. And since these industries have much more political clout than the farmers do, there is little support for rescuing farmers from their increasingly servile condition—and the idea has been largely forgotten. Farmers continue to get the message that the only way to succeed is to get big.[4]

The same pressure for farmers to increase in size applies to the beekeeping industry. Aside from the inexperienced or inattentive hobbyist, it is the large commercial bee outfits that have had the hardest time preventing their hives from collapsing due to varroa mites. Reports of winter losses attributed to mites of 40 to 50 percent and higher are all too common among those with six hundred hives or more. In truth,

the number of colonies an experienced beekeeper can manage successfully in this new era of mites is likely to be lower than those of prevarroa years, at least until new strains of bees have been developed that are either extremely resistant or outright immune to varroa.

Part of the allure of chemical pesticide use is the economic benefit that can be reaped by a reduction in labor—a cost that reflects the investment in time, and the attention to detail, required by nontoxic organic approaches to pests and disease. With the chemical approach proving itself to be less than satisfactory in many ways, those in the beekeeping industry may find themselves having to decrease their hive-to-beekeeper ratio to match their colonies with the amount of labor available to keep their hives healthy. The number of hives that a single beekeeper can inspect and treat in a timely manner is limited. This is especially true when one considers all the unexpected issues, from bad weather to flat tires, that typically arise and cause delays, forcing one to fall behind schedule. As conventional chemical treatments become less effective, the shift to nontoxic, labor-intensive management techniques will require new approaches and technologies to make up for these increased labor demands.

Aside from chemical resistance in the case of varroa mites, another key factor that affects hive survival, even when such control methods work, is the timing of mite treatments. There appears to be a certain threshold level of mite infestation within a colony that must be reached before the hive will begin to show signs of stress. An even higher threshold must be reached before the collapse of the colony is imminent. The longer the mites have to freely reproduce without hindrance, the more quickly these thresholds will be reached. By simply preventing the mite population from building up to critical levels, chances of colony survival are greatly increased, even when mites are present in the hive on a year-round basis. As a result, many beekeepers prefer to harvest honey and treat their hives earlier in the season than they used to, even though it may mean sacrificing a significant portion of the potential honey harvest.

In Vermont, this means we are usually finished taking honey off the hives by mid- to late August, so that a highly effective treatment can be applied before the consistently cool weather rolls around. Traditionally the honey harvest would not even get started before

late August in our region, and often not until September, thus taking advantage of the late-blooming goldenrod plant. Goldenrod often provides a large source of nectar-bearing flowers; the autumn honey flow they create results in rich yellowish amber honey. Instead of seeing an early end to the season as a detriment, it means that the entire process of harvest and treatment can be completed prior to the start of the goldenrod honey flow. This in turn tends to result in a much lighter crop of primarily clover and alfalfa honey, which features the more delicate bouquets and flavors favored by many honey consumers. Alternatively, the late-season flows may be harvested simply by taking steps to remove some of the mites throughout the season. A key to successfully using this late-season approach is to have only so many colonies in your care that you are able to harvest and treat in time to prevent a deadly threshold of varroa mites from being reached. This can be accomplished even while honey supers, the boxes of frames specifically intended to be filled by the bees with honey and harvested by the beekeeper, are on the hive. Ongoing mite control is accomplished by utilizing physical and mechanical control measures, that will not expose the honey crop to the potential risk of chemical contamination. The consistent elimination of a percentage of mites early on will delay their population buildup and allow for the application of a traditional late-season mite treatment, without giving the mites the opportunity to overwhelm the colony.

> Reports of winter losses attributed to mites of 40 to 50 percent and higher are all too common among those beekeepers with six hundred hives or more. The number of colonies an experienced beekeeper can manage successfully in this new era of mites is likely to be lower than those of prevarroa years.

It is possible that a strain of varroa might eventually evolve that learns to keep its reproductive rate low enough so its population within the hive does not overwhelm the host colony and cause its collapse, bringing about the mites' own demise in the process. We already know that some honey bees have adapted their behavior in order to coexist with varroa. The *Apis cerana* species of Eastern honey bee, for example, has learned to live in harmony with the varroa mite over the course of hundreds, or perhaps thousands, of years.

As we shall explore, beekeeping management techniques that help to develop similar behaviors in the Western honey bee, *A. mellifera,*

may lead to a climate of coexistence where the constant presence of mites may be tolerated within the hive without leading to the collapse of the colony. The sustainably minded beekeeper wishing to follow an organic approach to beekeeping should embrace this type of model. By adopting beekeeping management techniques that encourage coexistence, we humans can play an important role in the eventual development of permanent coexistence between *Apis mellifera* and *Varroa destructor*.

As a novice beekeeper, I relied greatly on the advice and suggestions of other beekeepers I met. I also read numerous books and articles on beekeeping. As a result, I am indebted to the kind and generous modern-day practitioners of this ancient craft who helped me get started on the road to becoming successful in apiculture. Today, as an active and experienced apiculturist, I find that the questions I am most often asked concern how to keep and manage honey bees without the use of toxic chemicals and still have hives survive the winters here in the northern latitudes. Perhaps this is a direct result of the increased media exposure that organic agriculture has received following the implementation of the National Organic Program (NOP), which was passed into law in 2002 by the United States Congress. It may be that the increased interest in chemical-free beekeeping that I have noticed, from hobbyists and commercial beekeepers alike, is a response to the increasing reports of environmental decline that is a result of some of our conventional agricultural techniques used on other crops. Ultimately, though, the interest in organic beekeeping may simply be a result of the use of toxic miticides and the backlash resulting from the mixed results of conventional apiculture's reliance on these chemicals to control predatory insects within the hive. Increased media reports of the ineffectiveness of conventional mite control approaches and the resulting devastating losses of hives by beekeepers have inspired a new wave of people to take up beekeeping, many of them wanting to get involved in an effort to find a way to help the honey bee survive and thrive without relying on chemotherapy treatments.

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Some Social Implications

I believe it is important for us beekeepers to share information with the nonbeekeeping community to help educate them about the many benefits of the honey bee. All too often, about the only thing the average person knows about bees is that they sting and they produce honey. The entire beekeeping industry stands to gain from the education of the general public regarding the benefits of the bee. On a professional level, the bond that can be forged from having direct contact with members of the honey-consuming public can prove invaluable in building a local market for hive products. This form of public relations becomes more and more important as communities continue to grow and agricultural land becomes more developed and densely populated. As humans and honey bees are forced to live in closer proximity to each other, more opportunities for unfortunate encounters are likely to develop. This has already resulted in the prohibition of beekeeping activities within the confines of many municipalities throughout the United States. In the years ahead, more towns and cities are likely to ban beekeeping within their borders. The importance of positive public relations as a preventive to public ignorance and prohibition of beekeeping activities will continue to expand. Meanwhile the growing demand for, and awareness of, organic foods by the general public may provide organically inclined beekeepers with a public relations edge over their conventional counterparts. The current state of the beekeeping industry certainly points to the need for new approaches and ways of thinking.

Following the development of the atomic bomb, Albert Einstein is said to have noted, "The release of atom power has changed everything except our way of thinking . . . the solution to this problem lies in the heart of mankind. If I had only known, I should have become a watchmaker." In many ways, the current dilemma facing the honey bee mirrors the challenge faced by the human race. In my opinion, some of the most difficult yet important work each of us can be involved in is our personal growth and evolution. If we no longer want to live in a world based on fear, lies, greed, and violence, and instead want to create a world where love, truth, peace, and compassion prevail, we must start with ourselves. Each one of us has the opportunity

to self-evolve and play an important role in creating a more peaceful and harmonious world simply by living a life in which these values are expressed on as consistent a basis as we can possibly muster. By the same token, we cannot rely on those in positions of power and leadership to solve the myriad social and environmental issues with which we are currently faced. Just as the ultimate answer for solving the numerous difficulties facing humankind lies in the raising of our society's collective consciousness, the most desirable and permanent solution to the difficult times the honey bee is now experiencing also lies in the bee's evolutionary process, through the development of resistance to disease and parasitic pests. The goal of raising humanity's collective consciousness requires the raising of each individual's consciousness to the point where enough of us evolve to affect society as a whole. This is not something that can be forced or imposed upon individuals. It is a responsibility each of us must choose to take upon ourselves in our own time, when we are ready. So it is with the honey bee that the evolutionary process must take place one hive at a time. Just as with us humans, the bee creates its own future with each seemingly insignificant daily decision and activity.

This realization has recently led me to start the process of examining and monitoring my own thoughts, feelings, and actions on a daily basis in an effort to identify those areas of my being that I wish to improve upon. Once they are identified, I can then begin the process of analyzing the source of my motivations and make the changes and shifts in my thoughts, beliefs, and actions necessary to bring about permanent change, whether it be altering unhealthy habits, changing ways of thinking that no longer serve me, letting go of false ideas and unproductive emotional responses, and so on. Albert Einstein is but one of many who have brought forth this message that I am only now just beginning to fully comprehend and embrace in my life . . . all with the help of the bees.

Notes

1. Malcolm T. Sanford, "Using Liquid Formic Acid for Mite Control," *Bee Culture* 131 (June 2003): 18.

2. *SEER Cancer Statistics Review, 1975–2003*, table I-14, "Lifetime Risk (Percent) of Being Diagnosed with Cancer by Site, Race/Ethnicity and Sex," National Cancer Institute, http://seer.cancer.gov/csr/1975_2003/results_merged/topic_lifetime_risk.pdf.
3. Larry Connor, "More on Drone Biology," *Bee Culture* 133 (September 2005): 19–21; and Jeff Pettis, Anita M. Collins, Reg Wilbanks, and Mark Feldlaufer, "Survival and Function of Queens Reared in Beeswax Containing Coumaphos," *American Bee Journal* 146 (April 2006): 341–44.
4. Brian Halweil, *Eat Here: Reclaiming Homegrown Pleasures in a Global Supermarket* (New York: W. W. Norton & Company, Inc., 2004): 63–64.